

December 2, 2019

The Honourable Jonathan Wilkinson  
Minister of Environment and Climate Change  
House of Commons  
Ottawa, ON K1A 0A6

Dear Minister Wilkinson,

On behalf of the Canadian Hydrogen and Fuel Cell Association (CHFCA) and our members, I congratulate you on your appointment as Canada's Minister of Environment and Climate Change. I look forward to working with you to continue the successful collaboration between the federal government and our association.

To this end, I am attaching a Key Messages document and recommendations on behalf of the association. Please contact me if you or your staff have questions or require further information.

As you may be aware, the CHFCA is a national, non-profit association that supports Canadian corporations, governments and educational institutions developing, demonstrating and deploying hydrogen and fuel cell products and services in Canada and overseas. As the voice of the world-leading Canadian hydrogen and fuel cell sector, our mission is to champion the sector, strengthen its leadership and accelerate the commercialization of our members' products and services in Canada and abroad.

Staff in the ministry of Natural Resources Canada are preparing a Hydrogen Roadmap for Canada. The CHFCA endorses this analysis. We anticipate that the findings will reinforce the policy and funding recommendations in the attached document. We hope that based on the joint message, the federal government will recognize the opportunity and take bold action to advance hydrogen energy in Canada.

Minister Wilkinson, thank you for your consideration of the hydrogen and fuel cell sector in Canada, as well as your continued support for innovation and the use of clean technologies.

We look forward to further discussion and collaboration with you to make a zero-emission future possible for all Canadians.

Sincerely,



**Mark Kirby**  
President/CEO

**Canadian Hydrogen and Fuel Cell Association (CHFCA)**  
660 - 475 West Georgia Street, Vancouver BC V6B 4M9  
Office: (604) 283-1040 | Mobile: (604) 657-8190 | Email: [mkirby@CHFCA.ca](mailto:mkirby@CHFCA.ca)

# The Canadian Hydrogen Energy Sector – Federal Policy and Funding Recommendations

## I. Key Messages for the Public

### 1. **The Hydrogen Energy Sector<sup>1</sup> is growing, generating jobs and attracting investment<sup>2</sup>.**

Recent examples include major expansions of low-carbon hydrogen production in Quebec & Alberta, including for export to Europe (as low-carbon methanol) and to the USA (as liquid); substantial foreign investment in leading sector companies; job growth and expansion in sector companies providing products and services for local and export markets; and investment in fueling infrastructure in BC and Quebec. Recent investments and those underway are estimated at over \$750 million. In BC, sector jobs increased 38% to 2,177 between 2015 and 2018. With increasing global interest and demand for low-carbon hydrogen energy systems and fuel cell solutions, this level of activity is likely to increase.

### 2. **Canada has leading companies and technology.**

Canada holds a global leadership position in fuel cell technology and hydrogen energy systems. Ballard Power Systems, Hydrogenics and Greenlight Innovation are recognized global leaders, while many other companies offer leading technology and products. Canadian companies secured 82% of the global market for heavy-duty transportation engines or component parts. In addition, companies like HTEC, Powertech and others offer leading hydrogen supply technology solutions. However, with little to anchor these companies to Canada, this expertise is at risk of moving out of Canada.

### 3. **Canada is the leading global low-carbon hydrogen producer with ample capacity for expansion.**

Blessed with substantial low-carbon intensity power capacity, (wind, hydro, nuclear, etc), Canada's production of low-cost electrolytic hydrogen can expand significantly for domestic use and export. In addition, Canada has ample fossil fuel reserves that can be converted to low-cost, low-carbon hydrogen through reformation and carbon capture and storage, (CCS). Alberta's Quest CCS project and CO<sub>2</sub> Trunk Line are among the leading technologies that will allow Canada to use hydrogen domestically and export our energy reserves as hydrogen, while leaving the carbon in the ground.

### 4. **Global demand for Canada's products and services is growing.**

Sector activity in China, Japan, Korea, Europe and California is high and continues to ramp up, while other countries such as Australia and India are becoming increasingly active. This activity, growth and emergence of new players will provide growing demand for Canadian products and expertise.

### 5. **Commercial Hydrogen Energy Systems and Fuel Cell Solutions are growing rapidly in availability.**

The most commercial hydrogen solution is the forklift with over 30,000 deployed globally, followed by more than 12,000 fuel cell cars and 2,500 fuel cell buses and trucks. Vehicles like Hyundai NEXO, Toyota Mirai, Honda Clarity, Mercedes GLC/FC and New-Flyer Xcelsior transit

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<sup>1</sup>"Hydrogen Energy Sector" includes low-carbon hydrogen production, distribution, storage, dispensing and related equipment and services, plus products and services related to hydrogen applications, such as fuel cells, fuel cell electric vehicles (FCEV), stationary fuel cells, hydrogen burners and appliances.

<sup>2</sup> See partial list attached.

buses are commercially available and sales are ramping up. The products available today offer great performance, high efficiency and reliability. With the help of Canadian fuel cell products and expertise, OEMs are successfully integrating fuel cell and hydrogen technology into their products and services. In the near future, commercial heavy-duty trucks, marine vessels, trains, off-road vehicles and even aviation products that offer excellent performance will surely be available. These products will be built with Canadian expertise and as volumes increase, they will be available at low cost.

**6. Challenging sectors of the economy can be decarbonized.**

Electrification and batteries are an essential part of the solution, but they cannot solve all of the hard-to-abate sectors. With the help of commercial fuel cell products and low-cost, low-carbon hydrogen, diverse industries can substantially reduce or eliminate GHG emissions and criteria pollutants with greater efficiency and lower cost. Starting with heavy duty transportation (buses, trucks, trains, marine) and moving into industrial processing (steel, chemical, refining) and even into personal transportation, aviation and home heating, hydrogen can help Canada's manufacturing and resource extraction industries to efficiently transform cities, ports and shipping processes to continue clean growth. Moreover, Canadians will continue to enjoy the lifestyle and choices which they are already accustomed to.

**7. Benefits and economic opportunity will flow to multiple sectors and regions with Canadian adoption.**

Integrating hydrogen energy into the Canadian economy will engage industries from coast to coast. In addition to Canada's leading low-carbon hydrogen and fuel cell and industrial gas companies, other sectors will profit from the transition:

- Oil and gas companies will dedicate their massive resources and talents to transforming our abundant fossil fuel resources into the transportation and heating fuel of the future: low-cost, low-carbon hydrogen. They provide the scale to ramp up the supply of the vast quantities of fuel that will be needed in Canada and abroad.
- Power companies will manufacture and store low-cost hydrogen from low-carbon power, providing grid stability and additional revenue from assets.
- Pipeline companies will move the low-cost hydrogen from production facilities to major industrial users and will ultimately help to heat Canadian homes.

**8. Canada can lead in demonstration and early commercial deployment.**

Globally, there is a pressing need for proven commercial fuel cell products and for proven applications of low-carbon hydrogen in heating and processing. Over the coming decade, dozens of OEMs and manufacturers will need to integrate, demonstrate and deploy hydrogen and fuel cells into their products and services. While Canada will never be a large market for these products, we can be the first market. Canada has the right mix of skills, existing assets and experience to effectively manage demonstrations and early commercial deployment. Due to our technical leadership, Canadian companies have participated in dozens of demonstrations within Canada and globally. With appropriate incentives, we can entice companies to Canada to gain that vital experience, while simultaneously building our expertise, developing exportable technology and reducing carbon emissions.

## 9. Canada can lead in the deployment of low-cost, low-carbon hydrogen infrastructure.

Deployment and demonstration of hydrogen and fuel cell products and applications must be supported with widely available low-cost, low-carbon hydrogen. Canada has a unique advantage as the largest producer of low-carbon hydrogen, but more must be done to build on this infrastructure: increasing capacity and making it widely available to support demonstrations and deployment from coast to coast to coast. Specifically:

- By expanding low-carbon hydrogen production from both low-carbon power & electrolysis; fossil fuel reformation & CO<sub>2</sub> sequestration.
- By expanding the hydrogen distribution network, including liquid trucking; gaseous pipeline; mixed hydrogen & natural gas pipeline; shipment as ammonia, methanol or in liquid organic hydrogen carriers.
- By increasing fueling infrastructure for all modes of transportation.
- By ensuring load is available through deployment of hydrogen energy applications.

## II. Key Messages: Call to Action

Canada must implement low-carbon hydrogen energy as an essential part of the solution needed to meet the Paris Climate Agreements. It promotes conservation, low-carbon power production, electrification, carbon-capture and utilization, and even the adoption of bio-products. The Canadian low-carbon hydrogen and fuel cell sector, built over the past 40 years with the investment of billions of dollars, provides a global competitive advantage and stands ready to pave the way to a carbon-neutral future by 2050.

This will only happen with appropriate policy and funding support for hydrogen applications at all Technology Readiness Levels. The CHFCA recommends the federal government implement the following actions:

### A. Policy

1. IMPLEMENT appropriate low-carbon fuel regulations to create a market for low-carbon hydrogen which will lower the carbon intensity of Canadian transportation and heating fuels. The CHFCA recommends the Clean Fuel Standard be structured to:
  - a. Ensure meaningful reduction is achieved in the carbon content of pipeline fuels (not limited to reduction in CO<sub>2</sub> emissions at production/distribution facilities).
  - b. Make capacity-based low-carbon credits available to support the funding of fueling infrastructure (similar to the California and BC models).
2. REVIEW and IMPLEMENT zero emission mandates and/or equivalent measures which have been shown to be effective in driving significant adoption of battery electric and fuel cell electric vehicles for light duty **and heavy duty** applications in BC, QC, California, Germany, China and elsewhere.
3. IMPLEMENT a mandate for the purchase of ZEV for government fleets.
4. IMPLEMENT tax credits for deployment of hydrogen infrastructure, products and applications.
5. MAKE credits available against ZEV requirements, low-carbon fuel regulation requirements and/or CO<sub>2</sub> emissions to secure critical private sector funding for demonstration and early deployment of hydrogen applications, (building on success of credits for fueling infrastructure as described in 1b above).

## B. Funding

6. INCREASE funding support for demonstration of early stage applications and commercial deployment of more mature technologies in Canada to advance applications, develop exportable Canadian expertise and to anchor sector companies in Canada. Specifically:
  - a. \$50 million over 3 years to support pre-commercial “lighthouse” projects for low-carbon hydrogen infrastructure at select locations across Canada to be matched by provincial and private sector funding.
  - b. Complementary funding to offset high cost of hydrogen products and applications during early commercial deployment.
  - c. \$50 million over 3 years to support demonstration of pre-commercial hydrogen products at locations across Canada to be matched by provincial and private sector funding.
7. INCREASE public spending on clean energy Research and Development with specific allocations for hydrogen and fuel cell technologies. Beyond securing and enhancing Canada’s leadership in science and technology, advanced R&D is an effective platform to recruit, train and retain global talent. Attracting and retaining highly-qualified personnel (HQP) is essential to scale-up and to accelerate the deployment of hydrogen technologies, products and services.
8. REVIEW requirements for matching commercial bank loans to qualify for non-dilutive federal project and loan funding from regional development agencies, Export Development Canada (EDC) and Business Development Canada (BDC). These measures will increase access to funding for hydrogen energy projects.

## c. Other

9. CREATE a commission to develop the codes and standards that will be needed to regulate hydrogen pipelines and distribution/storage equipment in a safe but practical manner.
10. ALIGN funding and programs to match provincial efforts on the accelerated development and deployment of hydrogen solutions.
11. CREATE bilateral and multi-lateral programs (e.g., via Mission Innovation Challenge 8) to support joint R&D efforts with partner countries. The recent changes to Tri-council programs provides a platform to engage with global partners on well-defined challenges.

## Partial list of investments in the Canadian Hydrogen Energy Sector

<b>Companies</b>	<b>Investment Description</b>
<b>Air Liquide</b>	<ul style="list-style-type: none"> <li>Investment in Hydrogenics</li> <li>Low-carbon LH2 plant expansion in Bécancour</li> </ul>
<b>Shell Quest Project &amp; Alberta CO2 Trunk Line</b>	<ul style="list-style-type: none"> <li>Two low-carbon H2 plants operating.</li> <li>Additional energy companies in Alberta are planning to sequester CO2 and convert fossil fuel H2 plants to low-carbon</li> </ul>
<b>Hy2Gen/Greenlight/Hydro-Quebec</b>	<ul style="list-style-type: none"> <li>\$100 million bio-CO2 + low-carbon hydrogen to methanol project for export to Europe</li> </ul>
<b>H2/FC research</b>	<ul style="list-style-type: none"> <li>\$91 million per year in BC</li> </ul>
<b>HTEC /Shell/Harnois/ Toyota / Hyundai</b>	<ul style="list-style-type: none"> <li>\$30 million of HFS installations in BC and Quebec with additional 10-15 planned (\$40 million).</li> <li>Deployment of 12 Nexo and over 60 Mirai FCEV in BC and Quebec, with more planned</li> </ul>
<b>AVL / Greenlight Innovation</b>	<ul style="list-style-type: none"> <li>Substantial AVL investment in Greenlight</li> <li>AVL expansion in Canada - investing in FC testing capabilities across Canada</li> <li>Greenlight at over 200 people &amp; expanding</li> </ul>
<b>Cummins</b>	<ul style="list-style-type: none"> <li>Majority acquisition of Hydrogenics, substantial investment in Loop Energy</li> <li>Incorporate FC technology in their heavy equipment power trains</li> </ul>
<b>Ballard</b>	<ul style="list-style-type: none"> <li>\$184 million investment by Weichai Power in Ballard</li> <li>Class 8 heavy duty truck project in AB</li> <li>Expanding research, service &amp; manufacturing capabilities: Denmark (marine center of expertise); China joint ventures (manufacturing of fuel cell products)</li> </ul>
<b>Illuming Power &amp; Overdrive Fuel Cell Engineering</b>	<ul style="list-style-type: none"> <li>New players expanding to serve China market</li> <li>Expanding and moving into new buildings</li> </ul>
<b>Dana/Freightliner/Ballard</b>	<ul style="list-style-type: none"> <li>Class 8 heavy duty truck project in Alberta</li> </ul>
<b>Tugliq Energy/Glencor</b>	<ul style="list-style-type: none"> <li>Mine vehicle project at Raglan mine, Quebec</li> </ul>
<b>Enbridge/Hydrogenics</b>	<ul style="list-style-type: none"> <li>Blend into NG line H2 from existing load management electrolyzer in Mississauga</li> </ul>
<b>Proton Technologies</b>	<ul style="list-style-type: none"> <li>In-situ reforming of fossil fuel deposits to produce hydrogen in Alberta</li> </ul>
<b>Planned</b>	
<b>Aeolis Wind / Blue Fuel</b>	<ul style="list-style-type: none"> <li>Wind projects in NE BC with H2 &amp; NH3 production</li> </ul>
<b>HTEC, FortisBC / BC Hydro</b>	<ul style="list-style-type: none"> <li>H2 production in BC for biochemical production</li> <li>H2 blending in NG pipeline</li> </ul>
<b>Tugliq/Glencor</b>	<ul style="list-style-type: none"> <li>Electrolyzer hydrogen project</li> </ul>
<b>Hydro-Quebec + industrial bio-tech company</b>	<ul style="list-style-type: none"> <li>H2 for biochemical production</li> </ul>
<b>Alberta energy &amp; pipeline companies</b>	<ul style="list-style-type: none"> <li>Low-carbon hydrogen blended in NG pipeline</li> </ul>